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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
VIDA, MELANIE M	

ART UNIT	PAPER NUMBER
2697	

DATE MAILED: 08/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/339,959	KAKUTANI, TOSHIAKI	
	Examiner	Art Unit	
	Melanie M Vida	2697	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10, 12-15* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *30 April 2003* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. This action is responsive to an amendment filed 4/30/03. **Claims 1, 5, 9, 12, 13, 14, and 15** are amended. **Claims 1-15** are pending.

Response to Argument

2. Applicant's arguments see pages 5-9, filed on 4/30/03, with respect to the rejection(s)of the following claims:

Claims 1-8, 12, and 14 rejected under 35 U.S.C. 102(b), as being unpatentable by Toshiaki et al. (EP 0820187 A2).

Claims 9-11, 13, and 15 rejected under 35 U.S.C. 103(a), as being unpatentable over Toshiaki et al in view of Shiau et al (US Patent Number 5,880,857) and further in view of well known prior art.

These claim arguments listed above have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection because of the applicant's traverse on the error diffusion step clarified during the Interview Summary, and the clarifying language amended in claim 5.

Claim Objections

3. **Claim 1** is objected to because of the following informalities: The specification does not match the claim language, as stated in the specification, (pg. 4, line 14), that "$2 \leq P \leq N$", however, in the claim, (lines 3-4), "$2 \leq P < N$", which conflicts with the former description.

Claim 15 is objected to because of the "priming medium", it appears it should read "the printing medium", (line 3).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

5. **Claims 1, 2, 12, 14** are rejected under 35 U.S.C. 102(e) as being anticipated by Morimatsu et al US Pat. No. 6,563,604 B1 (hereinafter, Morimatsu).

Regarding, **claim 1,** as shown in figure 1, a transaction process of gradation reproduction, Morimatsu discloses an electronic photo-printer, which reads on "a print-system", wherein the methods can be applied (col. 7, lines 17-23). A dot size is controlled in the process of tone modulation for gradation reproduction of images, which reads on "creates a plurality of dots and thereby prints an image on a printing medium", (col. 7, lines 17-23). Morimatsu inherently

teaches "a head configured to produce N different dots having different densities per unit area, where N is an integer of not less than 2", which is evidenced by the dot patterns in figures 6, 7, and 8, (col. 7, lines 1-15). As shown in figure 1, an image data input means (100), which reads on "an input unit", stores data of an input image (col. 3, lines 39-40). Morimatsu teaches that image data stored in the image data input means (100), is outputted to a pixel data obtaining means (101), that obtains image data of a pixel to the tone modulation, which reads on "is configured to input tone data with respect to each of the pixels included in an original image", (col. 3, lines 40-43). Morimatsu inherently teaches "a threshold value storage unit" as evidenced by the fact that the method can be implemented in hardware or software of a computer, (col. 7, lines 36-38). Further it is inherently taught by Morimatsu that "the threshold value storage unit is configured to store a plurality of threshold values according to possible tone values that the input tone data may take", as evidenced by figure 4, S240, S260, S280, S310, in which thrs1, thrs2, thrs3, and thrs, threshold values, are compared to magnitude pixel DATA input, (col. 6, lines 33-54). Further, Morimatsu inherently teaches "the threshold values including respective threshold values that correspond to P different dots, where P is an integer satisfying 2<=P<N", as evidenced by figure 4, in that the threshold values,

thrs1 in step S240, corresponds to S250, dot size=0,

thrs2 in step S260, corresponds to S270, dot size=1, and

thrs3 in step S280 corresponds to either one of S290, dot size=2 or S300, dot size = 3.

As shown in figure 1, a dot size decision means (105) determines a dot size, which reads on a "multi-valuing unit", (col. 5, lines 10). Morimatsu teaches of a dot size of 0, 1, 2, 3, and 4 dots, respectively, which reads on "to determine an on-off state of a dot", (col. 5, lines 16-19, line 25,

line 28). A dot size is derived in the dot size decision means from comparing a weighted image data represented by DATA', and an edge, which reads on "of the N different dots is to be created in each pixel based on density data", (col. 5, lines 10-12). As shown in figure 2, DATA' is outputted by the error diffusion calculation means (109), which reads on "density data obtained by an error diffusion distribution of an error, (col. 5, lines 12-14). As shown in figure 2, an error E(x,y) calculated by an error calculation means (107), represents a difference between an object picture data represented by DATA and the dot size, represented by Dsize, which reads on "said error representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel", (figure 1, col. 4, line 49-50; and col. 6, lines 55-57). The "dot creation unit configured to drive said head and create the N different dots having different densities per unit area based on results of the determination" is inherently taught as evidenced by Morimatsu's teachings of an electronic photo-printer, (col. 7, lines 20-23), wherein the transaction (figure 1) could be used to improve the gradation reproduction of images. This is illustrated in figures 6, 7, and 8, wherein variations in dot size are in proportion to image density, (col. 7, lines 1-5; col. 7, lines 20-23).

Regarding **claim 2,** as shown in figure 1, a transaction process of gradation reproduction, Morimatsu discloses an electronic photo-printer, which reads on "a print-system", wherein the methods can be applied (col. 7, lines 17-23). As shown in figure 4, a series of decision blocks for comparing DATA' with thrs1, thrs2, thrs3 to determine an output dot size of 0, 1, 2, or 3, respectively, which reads on "the corresponding threshold values are set to cause a creation ratio of the P different dots to smoothly change against the input tone value".

Regarding, **claims 12, and 14,** please refer to the like teachings of claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. **Claim 3, 6, 7, 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Morimatsu et al US Pat. No. 6,563,604 B1 as applied to claim 1 above, and further in view of Toshiaki et al. EP Pat. No. 0 820 187, (hereinafter, Toshiaki).

Regarding, **claim 3** Morimatsu teaches all the features of the printing system, but fails to expressly teach "the creation ratio represents a ratio of a density expressed by a specific dot, which is selected out of P different dots and created in a certain tone range, to a density to be expressed by the input tone data".

However, Toshiaki in figure 13 depicts a dot-recording ratio (0-100%), read as "the creation ratio" (fig. 13). Illustrated are two curves, light ink and deep ink, dot recording ratios, ratios of the deep level data represented by Dth on the right vertical axis, (0-255), and the input tone data represented by DS on the horizontal axis (0-255), which reads on "a ratio of a density expressed by a specific dot, which is selected out of P different dots and created in a certain tone range, to a density to be expressed by the input tone data", (page 10, lines 44-57), (page 10, lines 17-25).

At the time the invention was made it would have been obvious to a person of ordinary skill in the art to modify Morimatsu's printing system with Toshiaki's dot recording ratio.

One of ordinary skill in the art would use an index into a table of light dots as shown in figure 13, in order to reduce an algorithms computational complexity.

Regarding **claim 6,** Toshiaki illustrates in fig. 24 (2nd embodiment), that a larger threshold, EdTh1 and a smaller threshold EdTh2 are used for the determination among three different dots (pg. 16, lines 17-20).

Regarding, **claim 7,** as shown in figure 13, Toshiaki's depicts the dot recording ratio of light ink, C2 and deep ink, C1, have a continuous range, 0-255, corresponding to a continuous input tone data range, 0-255 (fig. 13), which reads on "the creation ratio takes significant values only in a continuous tone range, which is part of the possible tone values that the input tone data may take".

Regarding, **claim 8,** as shown in figure 17, the relationship between the threshold value Dref2, and the corrected data, DC, Toshiaki depicts preventing dot formation in the lower limit or the upper limit of the tone or turbulence of dot formation observed in a certain range under the condition of an abrupt change in tone in a specified area, which reads on "the creation ratio in a lower limit of the continuous tone range is set to be different from a specific tone value, at which the creation ratio of the P different dots abruptly changes when the corresponding threshold values are set to fixed values irrespective of the tone values", (pg. 12, lines 29-35).

7. **Claims 4, 5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Morimatsu et al US Pat. No. 6,563,604 B1 as applied to claim 1 above, and further in view of Li et al. US Pat No. 6,563,957 B1 (hereinafter, Li).

Regarding, **claim 4,** Morimatsu teaches all the methods of a print-system as disclosed in claim 1, but fails to expressly disclose "wherein at least two of the corresponding threshold values are set to an identical value in a specified input tone range".

However, as shown in figure 30, Li illustrates optimal upper and lower threshold value curves for a tone dependent error diffusion system. Li depicts an absorptance range (pixel value range), between 0 and 0.1, and 0.9 and 1, for which an upper and a lower threshold curve overlap, which reads on "wherein at least two of the corresponding threshold values are set to an identical value in a specified input tone range" ((col. 1, line 29-30; col. 18, lines 23-26).

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to modify Morimatsu's printing system with a step wherein two identical threshold values correspond to an input tone range.

One of ordinary skill in the art would have been motivated to use two identical threshold values for an input tone range in order to make homogeneous dot formations for tone ranges that are situated on the outer extremities of a tone scale range.

Regarding **claim 5,** Morimatsu teaches all the features of the claim 1, but fails to expressly teach where "the threshold value storage unit is configured to determine a difference between corresponding threshold values according to the input tone value, said difference having a plurality of points where a linear differential coefficient of the difference changes from minus to plus or plus to minus".

However, as illustrated in figure 21, Li depicts two curves, an upper threshold t_u , and a lower threshold, t_l situated in a threshold value range (0-1) vs. an absorptance range (0 – 1), which reads on "the threshold value storage unit is configured to determine a difference between

corresponding threshold values according to the input tone value, said difference having a plurality of points" (col. 14, lines 65-68). As illustrated in this graph, the upper threshold and the lower threshold curve increases globally, but has small pockets of decreases in local regions of the graph such as for the lower threshold curve, in the range of 0.6-0.8, which reads on where a linear differential coefficient of the difference changes from minus to plus or plus to minus".

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify Morimatsu's printing system method with Li's threshold value vs. absorptance range.

One of ordinary skill in the art would have been motivated to do this in order to model an adaptive thresholding technique vs. input tone scale with noise fluctuations to the data.

8. **Claims 9, 10, 13, 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Morimatsu et al US Pat. No. 6,563,604 and further in view of Shiau et al. U.S. Patent No. 5,880,857.

Regarding **claim 9**, please refer to the like teachings of claim 1, wherein Morimatsu teaches a printer-system, a head, an input unit, a multi-valuing unit, and a dot creation unit as described above.

Morimatsu does not expressly disclose a noise addition unit.

However, Shiau illustrates a perturbation of noise in an image signal and a threshold in fig. 7. That is, he discloses a random generator circuit, read as the noise addition unit in fig. 6, consisting of a random noise generator and a noise lookup table (Shiau, col. 5, lines 11-54). The noise lookup table is read as a preset noise value. Finally, this noise is added to a threshold value

and an image signal, (fig. 8, S21, and fig. 9, S22, respectively), (col. 6, lines 7-33), prior to modifying a multi-level gray signal, read as a multi-tone unit.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the printer-system and methods disclosed by Morimatsu with a noise addition unit as disclosed by Shiau.

One of ordinary skill in the art would have been motivated to do this in order to prevent error diffusion pattern shifting in image data given the express suggestion of Shiau, (col. 1, lines 9-15).

Regarding **claim 10,** as illustrated in figures 3 and 6, Shiau further depicts a noise generator circuit (5), comprised of a random number generator (11), and a noise lookup table (13), which adds (3), noise to the threshold (THRESHOLD + NOISE) prior to a comparator (1), which reads on "wherein said noise addition unit adds the preset noise data", (col. 4, lines 40-49; col. 5, lines 11-54). Steps S1, S21 as shown in figure 8, Shiau depicts that this noise is added to the tone data (S21) if the outcome of decision block (S1), is "YES", the gray level is equal to the values [¼ 1/3 ½], which reads on "only when the input tone data coincides with a predetermined tone value, and wherein the predetermined tone value used in said noise addition unit is set equal to a specific tone value", (col. 6, lines 7-19).

Regarding, **claims 13, and 15,** please refer to the like teachings of claim 9.

Allowable Subject Matter

9. **Claim 11** objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. **Claim 11** is allowable because the noise addition unit adds second noise

data, which has a greater absolute value than the first noise data. Shiau US Pat No. 5,880,857 teaches a "Perturb Threshold/Signal Relationship" in figure 7, (S2), however, he does not disclose that the noise addition unit adds second noise data, which has a greater absolute value than the first noise data.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yonekubo et al. US Pat. No. 6,328,400 B1 a printer system, method of generating an image, and recording medium for realizing the method.

Kakutani, US Pat No. 5,748,336 an image processing method and apparatus.

Kakutani, US Pat No. 6,543,870 B1 an image processing method.

Kakutani, US Pat. No. 6,099,105, a printing system, and method for recording images using multivaluing techniques.

Kakutani, US Pat No. 6,439,682 B1 a printing method, printing apparatus, and recording medium.

Kakutani, US Pat. No 6,089,691 a printing system and method of recording images.

Toshiaki, US Pat No 6,338,538 B1 a printing system and method of recording images.

Kakutani, US Pat. No 6,215,561 B1 an image processing method and apparatus.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melanie M Vida whose telephone number is (703) 306-4220. The examiner can normally be reached on 8:30 am 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kimberly A. Williams can be reached on (703) 305-4717. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-6743 for regular communications and (703) 305-4863 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Melanie M Vida
Examiner
Art Unit 2697

MMV
July 24, 2003

Kimberly A. Williams
Primary Examiner
Technology Center 2600